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USWEST

Ex Parte

December 4, 1996

William F. Caton, Acting Secretary
Federal Communications Commission
1919 M Street, N.W.
Room 222, SC-1170
Washington, D.C. 20554

Re: **CC Docket No. 95-116, *Telephone Number Portability***

Dear Mr. Caton:

U S WEST, Inc. on behalf of its operating affiliates, U S WEST Communications ("USWC") and U S WEST Media Group ("USWMG") respectfully submits the following paper entitled: "Impact of Number Portability on Networks: A Case Study of the Minneapolis MSA." This paper discusses USWC's analysis of the impact of implementing local number portability n its network serving the Minneapolis MSA. The paper is divided into four sections. Part I describes USWC's current network serving the Minneapolis MSA. Part II summarizes projected increases in traffic loads that will occur as a result of implementing number portability. Part III describes the additions and changes USWC must make to its network to accommodate number portability. Part IV explains the unique challenge an incumbent LEC such as USWC faces in engineering its network to accommodate number portability.

The paper is also being distributed to the Commission staff members listed below. Please place this letter and the attached paper in the record in this proceeding.

Acknowledgment and date of receipt of this letter are requested. A duplicate letter is attached for this purpose.

Sincerely,

Robert H. Jackson

cc: Andre Copelin
Mary De Luca
Gregory Forbes
Marian Gordon
Jason Karp
Jim Keegan
Regina Keeney
Kathleen Levitz
Geraldine Matise
Susan McMaster
Kent Nilsson
Jeannie Su
Richard Welch

U S WEST Communications, Inc.
CC Docket No. 95-116
December 2, 1996

IMPACT OF NUMBER PORTABILITY ON NETWORKS: A CASE STUDY OF THE MINNEAPOLIS MSA

U S WEST Communications, Inc. (USWC) submits this paper to describe the impacts number portability will have on its network.[1] To simplify the presentation, USWC limits this analysis to the impact number portability will have on its network serving the Minneapolis Metropolitan Statistical Area (MSA), now scheduled for conversion during the fourth quarter of 1997 (4Q97).

This paper is divided into four sections. Part I describes USWC's current network serving the Minneapolis MSA. Part II summarizes projected increases in traffic loads which will occur as a result of implementing number portability. Part III describes the additions and changes USWC must make to its network to accommodate number portability. Part IV explains the unique challenge an incumbent LEC like USWC faces in engineering its network to accommodate number portability.

The Commission should keep in mind that much of the data below is based upon the information available to USWC at this time. This data will be refined as vendors, following development and testing, are able to provide USWC with more specific requirements.

I. USWC's Current Minneapolis MSA Network

U S WEST Communications is the largest incumbent local exchange carrier (LEC) within the Minneapolis MSA.[2] USWC currently serves over 1.5 million access lines in this MSA, of which approximately two-thirds are residential lines and the other one-third are business lines.

USWC serves these 1.5 million access lines using 51 host and 49 remote switches. USWC's switching network in the Minneapolis MSA includes one access tandem switch, two local tandem switches, and one operator services switch (with six remotes). By switch type, USWC's Minneapolis MSA network consists of 26 Lucent 5ESS switches; 37 5ESS remotes; eight Nortel DMS 100 switches; 10 DMS remotes; 16 Lucent 1AESS

[1] USWC does not address in this paper the changes which must be made to its operations, customer support, billing and other systems to accommodate number portability.

[2] At least twelve other incumbent LEC also provide services within this MSA, six in Wisconsin (Amery, Baldwin, Frontier-St. Croix, Century, Hammon, and Spring Valley), and six in Minnesota (Bridgewater, Eckles, Lakedale, Scott Rice, Sherburne County, and Big Lake).

switches; one Ericsson AXE 10; and two AXE remotes. USWC's common channel signaling (CCS or SS7) network in Minneapolis is supported by a mated pair of Ericsson signaling transfer points (STPs).[3]

USWC's network in Minneapolis is relatively modern in terms of switch generics and features offered. For example, all but one of USWC's Minneapolis switches (the 5ESS operator services switch) are today connected to its CCS network. In addition, all but one of these switches (the Ericsson AXE 10) are equipped with Advanced Intelligence Network (AIN) capabilities.

USWC's CCS network in Minneapolis is used to support ordinary call setup; CLASS services (*e.g.*, caller ID); calling card and other LIDB-based services; 800 data base services; and certain AIN-based services (*e.g.*, select call routing).

II. Projected Increases in Traffic Loads Resulting from Number Portability

U S WEST Communications does not anticipate that, at least initially, number portability will either increase significantly call volumes or change dramatically current traffic patterns, USWC assuming that consumers will generally make the same types of calls after number portability is implemented that they made before the capability is deployed. Nevertheless, USWC expects that number portability will require an increasing number of USWC-to-CLEC voice trunks as the number of ported numbers grows in a given area like Minneapolis. This is because calls to ported numbers which had been USWC-USWC intraoffice calls (not requiring interoffice trunks) will be converted to USWC-CLEC interoffice calls (requiring interoffice trunks).

However, number portability will result in significantly higher loads on its CCS network because database queries will be required on virtually all interoffice calls — including, as noted, some call attempts that were once intraoffice. USWC builds its network to handle projected demand at the busy hour. The busy hour is our anticipated peak usage over a 2 or 3 year period. It does not include extraordinary circumstances that are not normally recurring. As explained in Attachment A, USWC currently estimates that its CCS network in Minneapolis must be expanded to handle an additional 787 queries per second to accommodate the implementation of number portability. Of course, USWC must expand its network capacity further if other carriers want to use USWC's network to process their number portability queries. *See* Part IV *infra*.

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[3] CCS networks are often referred to by the protocol used over most CCS networks: Signaling System No. 7 or SS7. STPs are basically CCS switches connecting switches (SSPs) with each other and SSPs with databases (SCPs).

III. Necessary Additions and Changes to USWC's Network

U S WEST Communications must upgrade its network to accommodate number portability. The principal upgrades are the installation of the number portability feature software, new base (generic) switch software like 5E11 (required to use the portability feature software), and new number portability processing databases (generally known as service control points or SCPs). However, USWC must also expand the capacity of its network to accommodate the additional traffic loads required by number portability. USWC must expand both its switching network and its CCS network, each of which is described below.

A. Switching Network Expansion

As noted above, USWC does not anticipate that number portability will change dramatically the call volumes its voice network must handle. However, number portability will increase substantially loads on USWC's CCS network because database queries must be generated on virtually every interoffice call. These new database queries, in turn, will add real time processing loads on USWC's switch processors which, as detailed below, often requires that the processors be upgraded and, in certain circumstances, requires the replacement of the switch itself.

1. DMS Processor Upgrades. USWC's Minneapolis MSA network includes eight DMS 100/200 switches. Currently, all eight switches are equipped with Nortel's SuperNode 20 processor. USWC musts upgrade the processors on all eight switches so they can handle the requirements dictated by number portability, with four upgraded to SuperNode 50, and the other four upgraded to SuperNode 60 or 70. Of course, USWC must also purchase and install new generic software (NA007) and the number portability feature package for all eight of these Nortel switches.

2. 1AESS Switch Upgrades and Replacements. USWC's Minneapolis MSA network includes 16 1AESS switches. USWC is planning to upgrade 14 of these switches (by installing the new 1AE13 generic) and to replace the remaining two switches.

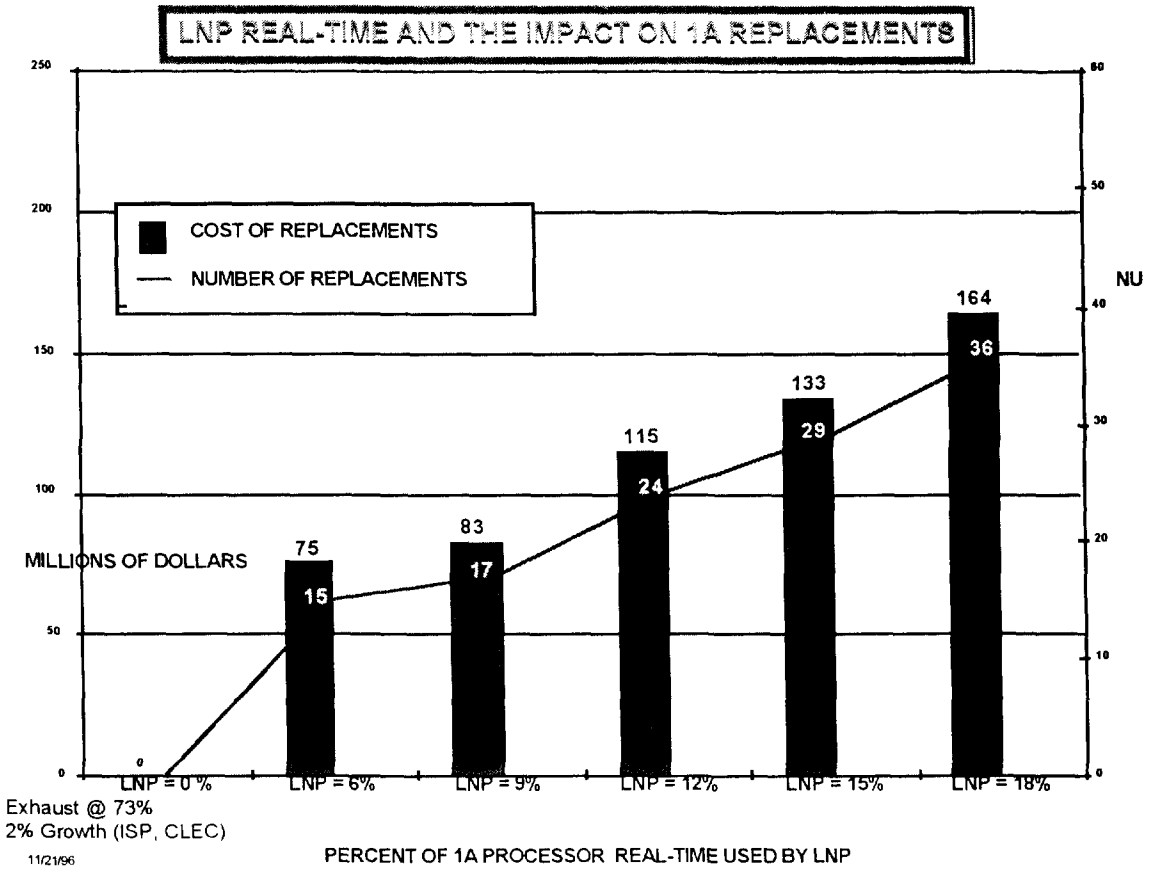
Experience teaches that a 1AESS switch should be replaced before its processor reaches 80% occupancy. At 70% processor occupancy USWC has learned that a 1AESS switch begins to encounter service impacting events (such as no dial tone at times, inability to complete calls, etc.) which are difficult to isolate or duplicate by maintenance technicians when the switch's processor reaches this level of occupancy. Above 73% to 75% occupancy service degradation increases in severity up to the 80% exhaust.

Lucent's official (*i.e.*, written) position is that a 1AESS switch will require about 6% more processor power to handle number portability. USWC is skeptical about this forecast because Lucent has not written (and, therefore, not tested) its number portability

software for the 1AESS switch. Consequently, Lucent's official 6% estimate appears to be based entirely on a theoretical switch model, which is particularly problematic for the 1AESS switch which is custom engineered — that is, each switch is programmed uniquely to serve the specific requirements of a given location. USWC is concerned that theoretical models will not match the realities of the wide variations in service feature profiles present in USWC's network.

Here is the dilemma USWC faces. Ideally USWC would replace a switch only if it was reasonably confident that the replacement was necessary.[4] However, Lucent has advised USWC that more solid forecasts concerning its 1AESS switches will not become available before 2Q97 at the earliest (presumably after the software has been written and preliminary tests have been conducted). If USWC were to wait for Lucent's more solid forecasts before deciding whether to replace its 1AESS switches, and if those forecasts indicated that one or more 1AESS switches needed to be replaced, then USWC would be unable to meet the FCC's 4Q97 deployment schedule for the Minneapolis MSA because it generally takes over a year to purchase, engineer, install, and test a new replacement switch. The table below demonstrates how USWC's 1AESS switch replacement schedule is influenced so greatly by the requirements number portability imposes on 1AESS processors:

[4] USWC has also examined the possibility of retaining the existing 1AESS and adding a new, adjacent switch to accommodate increased traffic loads. There are several reasons why this approach is not viable. First, some traffic that was once intraoffice traffic becomes interoffice traffic, creating the very situation sought to be avoided. Second, this approach does not eliminate the capital requirements of purchasing a new switch, and it increases maintenance expense because two different switches must now be maintained.



Based on the foregoing, USWC has decided that the most prudent course is to adopt a middle ground by assuming, for planning purposes, that number portability will increase occupancy loads on its 1AESS switches by 9%. Under this planning assumption, USWC must replace two of its 16 1AESS switches in the Minneapolis area.

USWC may find itself in a terrible predicament if subsequent events prove that this 9% estimate is understated. If implementation of number portability causes processor occupancy to exceed 80% at some of the 14 1AESS switches USWC did not replace and this increased load causes service impacting events, USWC will likely have to wait over a year for relief — because it generally takes over a year to purchase, engineer, and install new switches to replace the overloaded 1AESS switches.

3. 5ESS Upgrades. USWC must upgrade the generic in all 26 of its Minneapolis MSA 5ESS switches to the 5E11 generic as well as load the number portability feature package. USWC further expects that it must upgrade the processor (from 3B20 to 3B21) in some of its administrative modules.

Unlike other vendors, Lucent for its 5ESS switch (but not its 1AESS switch) has developed two different LRN software packages: basic and "deluxe." The basic package supports LRN but disables existing AIN features. Therefore, current customers who receive AIN services could not receive them in the future with the basic package. The so-called "deluxe" package re-instates the feature functionality of existing AIN triggers that the basic package disables. Consequently, USWC has no choice but to purchase the "deluxe" feature — even though Lucent charges 33% more just to retain existing features.

4. AXE 10 Upgrades. To support number portability, USWC must install AIN capabilities in the one Minneapolis Ericsson AXE10, in addition to the LRN software after the current LRN generic is loaded to the switch.

B. CCS Network Expansion

There are three components to USWC CCS network: (1) signaling links, (2) CCS switches, known as Signal Transfer Points or STPs; and (3) Service Control Points (SCPs), often referred to as processing, or downstream, databases.[5] Each of these three components is discussed below.

1. Signaling Links. Signaling links are the facilities connecting switches to STPs (CCS switches) and STPs to SCPs (or databases) which transport SS7 messages like number portability database queries.[6] USWC's Minneapolis MSA CCS network currently includes a total of 95 links. USWC estimates that, based on the load increases discussed in Part II above, it must install 51 additional links — for a total of 146 links — to support number portability in the Minneapolis MSA alone. These 51 new links are broken down as follows:

1	New SSP-STP links to serve the one end office not today equipped with SS7
6	Additional SSP-STP links to add capacity to existing SS7-equipped end offices
32	New STP-number portability SCP links
12	New C links (which connect the STPs which each other)

[5] These processing databases or SCPs must be distinguished from the administration databases used in connection with a service management system (SMS).

[6] SS7 messages traversing a CCS network generally fall into two categories: (a) Integrated Services User Part (ISUP) messages used largely in call setup; and (b) Transaction Capabilities Applications Part (TCAP) messages used in database query processing. ISUP messages are relatively short in length; for example, the typical Initial Address Message is 46 octets in length. TCAP messages are generally longer (because they contain more information; for example, the number portability database query will average 117 octets). Consequently, USWC must expand its CCS network not only because number portability will increase the number of CCS messages on its network, but also because number portability will change the overall mix of SS7 messages (percent of ISUP and TCAP messages).

These 51 links must be added solely to support number portability within the Minneapolis MSA. USWC also anticipates using its Minneapolis portability databases (or SCPs) to support number portability in other MSAs such as Omaha.[7] This will require USWC to install yet more links in its Minneapolis CCS network (*e.g.*, additional STP-SCP links).

2. Mated STP Pair. USWC's CCS network in Minneapolis is supported by a mated pair of Ericsson STPs which are currently equipped with the 21210 processor. According to the vendor, this equipment is capable of supporting 146 links; it is not capable of supporting the over 170 links which will eventually be required to support number portability in the Minneapolis and nearby MSAs. Therefore, USWC has no choice but to replace the 21210 processors with the larger 21220 processors.

3. Mated Number Portability SCP Pair. USWC must purchase and install a mated pair of number portability SCPs (or databases) to support number portability within the Minneapolis MSA before October 1997. The SCP platform USWC wants to use is capable of processing 1,148 queries per second (QPS) — within the 787 QPS increase forecasted for number portability.[8] However, the vendor is unable to make this 1,148 QPS system available before August 1997, which gives USWC insufficient time to install and test this new platform system before the October 1, 1997 deadline.

To meet the October 1 deadline, USWC intends to install and use temporarily a 450 QPS capacity platform. The problem with this temporary fix is that this platform will not be able to handle the projected 787 QPS demanded by number portability. USWC intends to address this problem by taking two steps. First, it will replace the 450 QPS system with the 1,148 QPS system as soon as the latter system becomes available. Second, until the new system is deployed, USWC will attempt to minimize the total number of portability queries by performing queries only on NXX codes where at least one number from that code has been ported. Under this approach, USWC will not originate queries for NXX codes where no numbers have been ported.

IV. The Big Unknown: Other Carriers' Use of USWC's Number Portability Capabilities

U S WEST Communications' immediate interest is to re-engineer the capacity of its network so it is capable of supporting number portability for calls originated by its

[7] USWC would use its Minneapolis SCP pair to support number portability in other areas when it is more efficient and economical to transport portability database queries to the Minneapolis SCP pair compared to installing and maintaining a separate SCP pair in another MSA.

[8] It is this excess in processing power that would enable USWC to use this SCP pair to support number portability in other areas. *See* note 7 *supra*.

own customers. In theory, USWC should not have to process number portability queries for other carriers because, under the LRN (or N-1) triggering method, other carriers should have performed their own queries before the call attempt reaches USWC's network. Besides, one of the major reasons the Commission decided to require database portability was to avoid the problem with interim number portability, where calls are initially routed to the old network.

Nevertheless, USWC anticipates that some carriers — be they interexchange carriers, CMRS providers, independent telephone companies, or CLECs — will attempt to deliver to USWC calls to ported numbers which they should have queried, but did not. Some of these carriers will deliver these ported call attempts, originated by their own customers, and will undoubtedly expect USWC to perform the necessary portability translation so the call attempt is routed to the correct carrier.

USWC is willing to perform the number portability function for other carriers so long as the interested carrier submits forecasts for its traffic so USWC can be confident that its network has sufficient capacity to handle the portability function for the carrier.[9] USWC will not process portability queries of other carriers unless the carrier enters into a contract with USWC and agrees to submit projected forecasts to USWC. USWC must have assurance that its network is large enough to handle not only its own customers' traffic but also the traffic of other carriers.

[9] Another important condition is that USWC must recover its costs, including some profit, when asked by another carrier to process its number portability database queries.

December 2, 1996

U S WEST Attachment A
CC Docket No. 95-116

Summary of U S WEST's Projected Increases In CCS Network Message Loads Resulting from Number Portability

This paper explains how U S WEST Communications (USWC) arrived at its forecast that its common channel signaling (CCS) network in Minneapolis must be capable of handling approximately 800 additional queries per second once number portability in the Minneapolis MSA. As becomes apparent, USWC used a "top down" approach — that is, first calculating CCS network load increases region-wide, then estimating the percent of queries which will be originated in the Minneapolis MSA.

Step No. 1: Calculate the average number of call attempts per line. USWC estimates that, on average, each of its customer's access lines originates 1.81 call attempts during the busy hour (or busy hour peg count). USWC calculated this figure by dividing the total call attempt rate during the busy hour (approximately 26 million) by the total number of lines (14.3 million year end 1995). This 1.81 busy hour peg count (BHPC) is within the range of published studies such as the LATA Switching Systems Generic Requirements (LSSGR).

Step No. 2: Calculate the average number of call attempts per line which will require a number portability database query. USWC estimates that, on average, each customer access line will originate 1.27 call attempts during the busy hour which will require a number portability database query. Calling patterns can differ dramatically between different switches. For example, in smaller communities, most local traffic is intraoffice traffic while in larger metropolitan areas most local traffic is interoffice traffic. On average, however, traffic patterns in USWC's network is as follows: (a) 11% is interLATA; (b) 65% is interoffice; and (c) 24% is intraoffice.

USWC will not originate number portability queries on the interLATA calls made by its customers. Portability queries likewise need not be performed on intraoffice calls. Predominantly, portability queries will be performed on interoffice calls which, on average, approximate 65% of all call attempts.

USWC will lose customers to competition and, for these lost customers, USWC will no longer have to originate their calls (or process number portability queries for them). However, line growth remains strong given the population growth in the West and consumers' growing need for telecommunications (*e.g.*, facsimile, Internet) which, in turn, often requires a second, third or even fourth line. USWC therefore estimates that, notwithstanding the loss of some customers to facilities-based competition, that over the next five years it will experience a net increase in access lines. In addition, number portability will be deployed initially in the larger metropolitan areas where there is a higher percentage of interoffice traffic compared to intraoffice traffic. USWC has therefore estimated that, over the next five years, its network must be capable of generating number portability queries on 70% of the call attempts made by its customers during the busy hour — or a busy hour peg count of 1.27.

Step No. 3: Estimated region-wide increase in CCS queries per second. USWC estimates that, region-wide, number portability would generate approximately 6,200 additional CCS queries per second if number portability were deployed ubiquitously. USWC calculated this figure as follows: USWC estimates that, by the end of year 2001 it will serve a total of 17.6 million access lines. Multiplying this estimate by the average portability busy hour peg count of 1.27 results in a total busy hour peg count of 21,296,000. Converting this figure to queries per second results in approximately 6,200 CCS queries per second.

Step No. 4: Estimated queries in areas covered by portability mandate. Number portability will not be deployed ubiquitously, at least initially. USWC estimates that, given the 10 MSA end-of-1998 requirement, coupled with other areas where carriers will request number portability, that its network must be capable of supporting only 90% of the total, region-wide number of portability queries. Ninety percent of 6,200 queries per second approximates 5,500 queries per second. USWC therefore estimates that, to support number portability in the areas where the capability will

likely be provided, its network must be capable of supporting, overall, 5,500 CCS queries per second.

Step No. 5: Calculate estimates queries originated in the Minneapolis MSA. Traffic originated in the Minneapolis MSA, based on current ISUP (or call setup) SS7 messages, represents 14.3% of USWC total, region-wide ISUP messages. USWC therefore estimates that its CCS network in Minneapolis must be capable of supporting an additional 797 queries per second (5,500 total queries x 14.3%).